

English Translation of
PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT
(PCT Article 36 and Rule 70)

Applicant's or agent's file reference: YTLOJS-001T

For further action:

See Notification of Transmittal of International
Preliminary Examination Report
(From PCT/IPEA/416)

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classification and IPC: Int.Cl' H02K 41/03

Applicant: YOKOHAMA TLO COMPANY, Ltd.

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 3 sheets, including this cover sheet.
3. This REPORT is also accompanied by following ANNEXES.
 - a. These annexes consist of a total of 1 sheets.
 The Description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).
 - b. (Omitted)

4. This report contains indications relating to the following items:

- I. x Basis of the report
- V. x Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Date of submission of the demand: 31 August 2004(31.08.2004)

Date of completion of this report: 14 February 2005(14.02.2005)

International Preliminary Examination Report

International application No.
PCT/JP03/11017

I. Basis of the report

1. Omitted

2. This report has been drawn on the basis of the following documents. Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments.

x specification:

• pages 1-35, originally filed,

x claims:

• claims 2-4, originally filed,

• claim 1, amended on the basis of PCT Rule 19

x Figures:

• Figs. 1-22, originally filed.

3. (Omitted)

4. (Omitted)

V. Reasoned statement under Article 35 (2) with respect to novelty, inventive step or industrial applicability; citations and explanations supporting such statement:

1. STATEMENT:

Novelty (N)	Claims <u>1-4</u>	YES
Inventive step (IS)	Claims <u>1-4</u>	YES
Industrial Applicability(IA)	Claims <u>1-4</u>	YES

2. CITATIONS AND EXPLANATIONS (PCT Rule 70.7):

Document 1: JP 10-257751 A (CKD Corp.) 25 September, 1998 (25.09.1998), full text; all drawings

Document 2: Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 127580/1985 (Laid-open No. 38080/1987) (Hitachi Zosen Corp.), 06 March, 1987 (06.03.87) Full text; all drawings

Document 3: JP 57-501458 A (Odeski Polytechnicheskii Institute), 12 August, 1982 (12.08.1982), Full text; all drawings & WO 82/01286 A1

Claims 1-4

In a spiral-type linear motor, a central axis is set up in a hollow magnetic pole of a stator, an axial lateral face of spiral part of a rotator and an axial lateral face of spiral groove of a stator are opposed, the stator spirally rotates easily in a spiral groove of the hollow magnetic pole, the rotator moves linearly in an axial direction rotating spirally against the stator.

The above-described constitution is not described in any document cited in the International Search Report, is not obvious to a person having skill in the art.

AMENDED CLAIMS

Received by International Bureau (Feb. 17, 2004)

Claim 1 in the original application was amended.

Other claims are not amended.

CLAIMS

1. (Amended) A spiral linear motor, comprising:
 - a rotator that comprises a center shaft and a spiral-shaped portion protruding in the radial direction, provided on the outer circumference of the center shaft; and
 - a stator comprising hollow magnetic poles forming a center space having a spiral-shaped groove with the same pitch as the rotator,
 - wherein the center shaft of the rotator is within the hollow magnetic poles forming a center space of the stator;
 - the side face of the spiral-shaped portion of the rotator in the axial direction and the side face of the spiral-shaped groove of the stator in the axial direction are opposed to each other;
 - the spiral-shaped portion is rotatable in a spiral shape within the spiral-shaped groove of the hollow magnetic poles forming a center space; and
 - the rotator moves linearly in the axial direction while

rotating in a spiral shape with respect to the stator.

2. The spiral linear motor according to claim 1, wherein the rotator comprises a permanent magnet on the spiral side face of the spiral-shaped portion.

3. The spiral linear motor according to claim 1, wherein the stator has windings of two phases that are mutually displaced through 90 degrees on both spiral-shaped side faces of the mid-air gap magnetic pole wound in the axial direction of the stator.

4. The spiral linear motor according to claim 1, wherein the stator comprises a slot on both spiral-shaped side faces of the mid-air magnetic pole; and

the winding is wound in the slot.

Explanation Based on Section 19 (1) of the Convention

Patent Claim 1 has clarified the constitution in which the side face of the spiral-shaped portion of the rotator in
5 the axial direction and the side face of the spiral-shaped groove of the stator in the axial direction are opposed to each other.

Note that this amendment is based on the descriptions in, for example, the line 18 on Pg. 2 to the line 2 on Pg.
10 3, Fig. 1 and the line 23 on Pg. 5 to the line 6 on Pg. 6, and Fig. 8 and the line 8 to 21 on Pg. 8.

In Cited Reference 1 (JP10-257751) (CKD Corporation), which has particular relevance among the cited reference, the external magnetic screw 1 is obtained by covering the
15 rod 2 as a core with a magnet in which is formed the north polarized belt 4. In the microfilm obtained by filming the contents of the specification and drawings that are attached to the application of Cited Reference 2 (Japanese Utility Model Registration Application No. 60-127580,
20 Japanese Utility Model Registration Application Laid-open No. 62-38080) (Hitachi Zosen Corporation), the spiral groove formed in the rotator 4 is constituted along with the external spiral groove 6 on the rotator 2 side with a bearing ball for rolling bearing. Further, in Cited
25 Reference 3 (JP57-501458) (Odeski Polytechnicheskii Institute), the spiral-shaped salient poles formed in the stator and rotor are obtained by causing the

circumferential faces thereof to oppose to each other.

In addition, any of the above Cited References 1 to 3 does not have a constitution in which the side face of the spiral-shaped portion of the rotator in the axial direction and the side face of the spiral-shaped groove of the stator in the axial direction are opposed to each other. In the constitutions of these Cited References, therefore, the magnetic flux cannot obtain a large thrust which enters and leaves in a direction perpendicular to 10 the direction of movement (axial direction).

On the other hand, the present invention comprises the above-described constitution, whereby the magnetic flux of either the winding or the magnet is in the direction of movement (axial direction), and the area to the magnetic 15 flux becomes large, thus it is possible to have an effect of generating a large thrust.